

DOCKET NO. D-71-86-2

DELAWARE RIVER BASIN COMMISSION

**E. I. du Pont de Nemours and Company
Edge Moor Titanium Dioxide Facility Industrial Wastewater Discharge
Edgemoor, New Castle County, Delaware**

PROCEEDINGS

This docket is issued in response to an application submitted to the Delaware River Basin Commission (DRBC or Commission) by E. I. du Pont de Nemours and Company (DuPont) on January 5, 2007 (Application), for the renewal and update of the Edge Moor facility's Industrial Wastewater Treatment Plant (IWTP), stormwater and non-contact cooling water discharges and for approval of the installation of a multi-port effluent diffuser to replace their existing IWTP outfall. The Delaware Department of Natural Resources and Environmental Control (DNREC) is delaying approval of the diffuser portion of the project until approval by the DRBC. DNREC issued amended National Pollutant Discharge Elimination System (NPDES) Permit No. DE0000051 on November 30, 2006, effective January 1, 2007.

The Application was reviewed for approval under Section 3.8 of the *Delaware River Basin Compact*. The New Castle County Department of Land Use and Planning has been notified of pending action. A public hearing on this project was held by the DRBC on December 12, 2007.

A. DESCRIPTION

1. Purpose. The purpose of this project is to update and renew the DuPont Edge Moor Titanium Dioxide production facility's IWTP (Outfall No. 001) and non-contact cooling water and stormwater discharges (Outfalls Nos. 002 and 003) and approve the installation of an effluent diffuser and outfall extension for Outfall No. 001.

2. Location. The docket holder's titanium dioxide production facility is located in Edgemoor, New Castle County, Delaware. The treated industrial wastewater, stormwater and non-contact cooling water are discharged to Water Quality Zone 5 of the Delaware River at river mile 73.3.

The project outfalls are located in the Delaware River Watershed as follows:

OUTFALL NO.	LATITUDE (N)	LONGITUDE (W)
001 (IWTP- existing)	39° 45' 15.7"	75° 29' 32.3"
001 (IWTP – new diffuser)	39° 45' 11.38"	75° 29' 21.28"

OUTFALL NO.	LATITUDE (N)	LONGITUDE (W)
002 (NCCW & stormwater)	39° 45' 09.8"	75° 29' 42.6"
003 (NCCW & stormwater)	39° 44' 41.3"	75° 30' 01.4"

3. Area Served.

Outfall 001: The docket holder's IWTP receives wastewater, process and stormwater flows from the titanium dioxide production facility, located entirely within the Edge Moor facility. The IWTP does not receive any off-site wastes. See submitted "Process Diagram" for the IWTP for more details.

Outfall 002: The docket holder discharges non-contact cooling water (& stormwater) from the Aqua Fox process from Outfall 002. At the time of docket approval, the Aqua Fox process was not in use. DuPont shall notify the Commission in writing when the Aqua Fox process is initiated and non-contact cooling water is planned to be discharged from Outfall 002.

Outfall 003: The docket holder discharges non-contact cooling water (& stormwater) from Line II (reaction, purification, oxidation, and finishing activities) operations from Outfall 003.

For the purpose of defining the Area Served, the Application is incorporated herein by reference consistent with conditions contained in the DECISIONS section of this docket.

4. Physical features.

a. Design criteria. The docket holder's IWTP treats the process wastewater associated with the production of titanium dioxide, titanium tetrachloride, and ferric chloride. The IWTP was originally approved by DRBC for a design flow of 7.33 mgd. This docket approval reduces the docket holder's IWTP discharge to 5.2 mgd.

b. Facilities. The DuPont Edge Moor manufacturing facility and supporting operations consist of the reaction, oxidation, TiO₂ finishing, and co-product area. In the reaction area, titanium-bearing ores are chlorinated to produce four major streams:

1. a tail gas stream containing the non-condensable vapors formed in the process
2. pure titanium tetrachloride
3. ferric chloride solution
4. aqueous metal chloride solution containing coke & ore solids formed during ore chlorination

The tail gas stream from the reaction area is scrubbed with caustic and water in the fume disposal area to remove titanium tetrachloride (TiCl₄), hydrochloric acid (HCl), sulfur

dioxide and any residual chlorine. The first scrubbing step in fume disposal is to react the tail gas with water to remove TiCl_4 and HCl . The reaction of water and TiCl_4 results in formation of aqueous HCl which is directed to a storage tank at the north end of the plant. The HCl is sent from the storage tank to a dedicated neutralizer and reacted with lime. The resulting solution is directed to the head of the wastewater treatment operation for additional treatment. The second phase of scrubbing in the fume disposal area utilizes caustic to remove SO_2 and chlorine. Before the spent caustic solution is sent to the waste water treatment plant, urea is added to reduce any sodium hypochlorite that may be present so that chlorine gas is not released in the process sewer.

The pure titanium tetrachloride stream is oxidized to produce the titanium dioxide product in the oxidation area. The oxidation area produces two primary streams, chlorine and titanium dioxide slurry. The chlorine is recycled to the process chlorinator, and reused to convert metal oxides to metal chlorides again. The TiO_2 slurry stream is further screened and milled to obtain the desired particle size then shipped as a final product. There is a small stream of TiO_2 and water that is directed to the waste water treatment plant from this area. The reaction and oxidation areas utilize a cooling tower for heat removal from the titanium tetrachloride and titanium dioxide heat exchangers. The cooling tower water is treated with chlorine (as a biocide) and a commercially purchased dispersant (milsperse or drewsperser). The blow down from the cooling tower is directed to the waste water treatment plant.

As part of the TiO_2 ore processing, other low pH materials are generated in the manufacturing operations such as aqueous ferric chloride, and spent coke & ore solids mixed with a solution of ferrous chlorides and other metal chlorides solution which need to be neutralized prior to land filling of solids and discharge of wastewater. The aqueous ferric chloride solution is purified to remove solids and then sold as a commercial product. The resulting acidic solids from ferric chloride solids removal process as well as the spent coke & ore ferrous stream and solids metal chloride solution are combined and then sent to the neutralization area (draft tube) where lime slurry is added to neutralize the materials to a pH of 6 - 9. The resulting neutrates solution is filtered and the filter cake is landfilled off-site while the filtrate is directed to the head of the wastewater treatment plant for trimming pH to 6-9 as well as removal of any residual solids.

Wastewater generated from these four streams are directed to the wastewater treatment plant prior to discharge. The TiO_2 manufacturing area process sumps are directed via a forced main into two equalization tanks where caustic or hydrochloric acid can be added for pretreatment neutralization which then discharges to the weir box. The weir box is the junction of all streams at the head of the wastewater treatment plant. Similarly there are storage tanks for the ferric chloride, and aqueous metal chloride solution containing solids which are then pumped to the weir box. There are also gravity flow streams from operating areas that feed into the weir box but they are generally neutral streams that contain trace solids.

Wastewater enters the weir box where either lime, caustic or aqueous hydrochloric acid are added as it enters the 1st stage neutralization cell to adjust the pH between 6 – 9. If necessary caustic can be added at the second stage neutralizer cell directly by way of either a pumped feed line or an emergency gravity based head tank. The hydrochloric acid systems feeding the wastewater plant are via pumped feeds or gravity drains from emergency totes. Wastewater next enters a second neutralization cell, where polymer addition occurs to grow flocculated solids in preparation for separation via settling. Wastewater is then directed by a splitter box (where additional polymer addition can occur if needed) and the stream is split into one of two clarifiers (North or South). The two clarifiers replaced previous dissolved air flotation (DAF) units. The settled solids from the bottom of the clarifiers are pumped to a filter press for solids separation where the solids are landfilled and the filtrate is directed back to the inlet of the weir box at the inlet of the wastewater treatment plant. Effluent from the clarifiers is then combined before discharging to “Pond E”. Effluent from “Pond E” is then discharged via Outfall 001 to the Delaware River.

The docket holder is proposing to extend the existing Outfall 001 689 ft (210 m) into the Delaware River and to add a multi-port diffuser. The new outfall extension will be constructed of 10” diameter fiberglass reinforced plastic (FRP) force main. A new pump station will be installed as part of the outfall extension. The outfall pipe alignment is approximately 125 degrees from true north (clockwise) and roughly perpendicular to ambient river currents. Once the outfall line exits the pump station, there will be a continuous 3 foot of cover depth between the pipe and the river bottom in order to protect the outfall line from damage. The final optimized diffuser design consists of a 3-port, 6-inch diameter diffuser with ports spaced 7.5 m apart (total diffuser length of 15 m). The diffuser will be approximately 9 m deep at low tide. The ports will be oriented vertically to maximize the travel time of the plume to contact with the bottom since the discharge is less dense than that of river. The diffuser is to be aligned perpendicular to the shoreline and ambient currents to maximize mixing of the effluent with the river.

Prior facilities and processes for the IWTP have been described in DRBC Docket No. D-71-86, approved by DRBC on July 27, 1973.

The project facilities are above the 100-year flood zone.

The plant DCS control systems are equipped with an UPS battery that allows continued window into the operation in the event of loss of power. The pigment manufacturing plant is equipped with emergency power to allow the safe and orderly shutdown and continued operation of air pollution control equipment. A loss of power will result in a shutdown of all manufacturing facilities at the plant. When there is a loss of power the process feeds from area lift stations associated with hydrochloric acid produced in tailgas scrubbing, titanium tetrachloride processing, ferric chloride processing, and metal chloride solution containing coke & ore solids are held up in feed tanks and are stopped from feeding the wastewater plant. These

streams are held up in storage tanks until power is restored. The residual material in the wastewater plant can be controlled using the emergency caustic or hydrochloride acid totes. If necessary the flows from Outfall 001 to the river can be curtailed by adjusting the cooling pond overflow weir. The DCS control system, with battery backup coupled with emergency diesel air driven compressors allows the continued viewing and limited control of the operation until power is restored.

Wasted sludge will be hauled off-site by a licensed hauler for deposit at a (State-approved) facility.

c. Water withdrawals. The potable water supply in the project service area is provided by United Water.

The process water withdrawal from the Delaware River is described in detail in Entitlement No. 179, which approved a withdrawal of 818.611 million gallons per month, which was approved on July 15, 1976. The docket holder currently operates below the approved withdrawal rate.

d. NPDES Permit / DRBC Docket. Sanitary wastewater generated on site is sent to the City of Wilmington for wastewater treatment. The NPDES Permit No. DE0000051, issued by DNREC on November 30, 2006, effective January 1, 2007, includes final effluent limitations for the project discharges from the facility to surface waters classified by DNREC for industrial water supply, primary and secondary contact, recreation, and fish, aquatic life and wildlife. The following daily average effluent limits are among those listed in the NPDES permit and meet or are more stringent than the effluent requirements of the DRBC.

EFFLUENT TABLE A-1: DRBC Parameters Included in NPDES permit for Outfall 001 (IWTP - Process Wastewater which includes stormwater associated with manufacturing operations)

OUTFALL 001 (IWTP)		
PARAMETER	LIMIT	MONITORING
Flow	5.2 mgd	As required by NPDES permit
pH (Standard Units)	6 to 9 ***	As required by NPDES permit
Total Suspended Solids	20 mg/l (85% minimum removal*)	As required by NPDES permit
BOD (5-Day at 20° C)	30 mg/l 1300 lbs/d = 1430 lbs/d of CBOD ₂₀	As required by NPDES permit
Temperature	112 ° F (Instantaneous Max)	As required by NPDES permit
Acute Toxicity	6.7 TUa	****

* DRBC Requirement

*** See DNREC NPDES Permit (99% of time during any calendar month)

**** See Condition II. f. (The docket holder shall monitor for Acute Toxicity 1 time / month when specific conductivity at Outfall No. 001 is less than or equal to 40,000

microSiemens per centimeter ($\mu\text{S}\cdot\text{cm}^{-1}$). When specific conductivity exceeds 40,000 ($\mu\text{S}\cdot\text{cm}^{-1}$), the docket holder shall conduct Acute Toxicity monitoring 2 times / month until the specific conductivity is less than or equal to 40,000 ($\mu\text{S}\cdot\text{cm}^{-1}$). Upon completion of the Outfall 001 extension and diffuser project, the effluent limit for Acute Toxicity shall apply.

After 18 months of monthly sampling, the docket holder can request in writing to the Executive Director to modify the acute toxicity monitoring frequency requirement from monthly to quarterly.

The docket holder may conduct the monthly acute toxicity monitoring on cladoceran (*Daphnia magna*). If the docket holder is granted the quarterly acute toxicity monitoring frequency, both cladoceran (*Daphnia magna*) and the fathead minnow (*Pimephales promelas*) should be tested.

EFFLUENT TABLE A-2: DRBC Parameters Not Included in NPDES Permit for Outfall 001 (IWTP)

OUTFALL 001 (IWTP)		
PARAMETER	LIMIT	MONITORING
Total Dissolved Solids*	Monitor & Report *	Twice per month **, *****
Specific Conductivity *	Monitor & Report *	Same sample time/date as TDS *
Ammonia Nitrogen *	35 mg/l *	Once per month*
PCBs *	Monitor & Report *	As required by NPDES permit

* DRBC Requirement

** See Condition II. dd.

***** See Condition II. n.

EFFLUENT TABLE A-3: DRBC Parameters Included in NPDES Permit for Outfall 002 (NCCW and stormwater)

OUTFALL 002 (NCCW)		
PARAMETER	LIMIT	MONITORING
Flow	2.89 mgd	As required by NPDES permit
Temperature	110 ° F (Instantaneous Max)	As required by NPDES permit
pH	6 to 9 ***	As required by NPDES permit
PCBs *	Monitor & Report *	One wet-weather sample / year*

* DRBC Requirement

*** See DNREC NPDES Permit (99% of time during any calendar month)

EFFLUENT TABLE A-4: DRBC Parameters Included in NPDES Permit for Outfall 003 (NCCW and stormwater)

OUTFALL 003 (NCCW)		
PARAMETER	LIMIT	MONITORING
Flow	5.9 mgd	As required by NPDES permit
Temperature	112 ° F (Instantaneous Max)	As required by NPDES permit
pH	6 to 9 ***	As required by NPDES permit

* DRBC Requirement

*** See DNREC NPDES Permit (99% of time during any calendar month)

- e. **Cost.** The overall cost of this project is estimated to be \$ 4,055,000.

B. FINDINGS

The docket holder was sent a letter dated November 4, 2005 requesting that DuPont submit the proper application materials to the Commission for the review and approval of the extension and addition of a diffuser to Outfall 001. In addition to the review and approval of the Outfall 001 extension and diffuser, several operational changes made by the docket holder were required to be incorporated into the new docket.

Since the last docket approval (July 27, 1973), DuPont has reduced its environmental footprint through the following actions; (1) closed the iron chloride and iron sulfate holding ponds in compliance with the applicable DNREC regulations and replaced those ponds with above ground storage tanks, (2) discontinued the ocean disposal of certain waste streams and installed processes to recycle and reuse some of these by-products, (3) significantly reduced the amount of cooling water utilized at the facility by recycling some of the cooling water through cooling towers, and (4) reduced the amount of wastewater generated at the facility from 7.33 mgd to 5.2 mgd.

The docket holder submitted application materials to the Commission on January 5, 2007.

Acute Toxicity Mixing Zone

Zone 5 stream quality objectives exist for toxic pollutants. They include criteria to protect the taste and odor of ingested water and fish (Table 4 of WQR), to protect aquatic life (Table 5), and to protect human health (Tables 6 & 7). Toxicity in effluent is measured as Whole Effluent Toxicity (WET), and is results from both acute and chronic exposures. The acute toxicity stream quality objective for Zone 5 is 0.3 Toxic Units (TUa = 0.3). The docket holder's studies indicate that the current discharge from Outfall 001 results in an instream exceedance of the Zone 5 acute toxicity stream quality objective. The docket holder's studies indicate that the Edge Moor facility's acute toxicity is due to calcium chloride salt in their industrial wastewater discharge

(Outfall 001). Outfall 001 is located approximately 4.5 miles upstream of the Delaware Memorial Bridge, which defines the demarcation point between marine and fresh water in the Delaware River. The Commission regulations, however, provide for site-specific mixing zones.

DuPont performed a toxicity identification evaluation and toxicity reduction evaluation (TIE/TRE) on its wastewater effluent at the time it started to fail screening level acute toxicity testing. The study identified the source of toxicity as elevated concentrations of calcium chloride due to the large amount of neutralized materials from manufacturing. The main sources of calcium chloride come from the neutralization of the HCl scrubber wastewater and the neutralization of spent ore. The study looked at modifying manufacturing operations (1), end of pipe treatment (2), and installation of an effluent diffuser (3) to reduce toxicity at the Outfall 001 discharge location.

1. DuPont determined that there was no environmental benefit in modifying the manufacturing operations by reducing chlorides in the wastewater since the chlorine-ilmenite process produces a higher quality product and, overall, generates less waste versus other titanium dioxide manufacturing type operations (i.e. sulfate process).
2. DuPont determined the most cost-effective wastewater treatment technology to reduce chlorides in the wastewater to acceptable levels is reverse osmosis (RO). RO would concentrate the chlorides into a smaller waste stream, which would have to be evaporated to a dry cake to be acceptable for land filling. DuPont determined that the RO-evaporation treatment option was not viable due to its energy intensive operations.
3. DuPont evaluated an effluent diffuser, which would reduce acute toxicity by appropriate dispersion. The existing discharge location is a shoreline discharge, which does not provide adequate mixing with ambient waters. A more effective outfall diffuser could be installed to achieve sufficient mixing with ambient waters.

WQR Section 4.20.5.A.1.a defines the guideline acute mixing zone as the more stringent of:

- 1). *A distance of 50 times the discharge length scale in any direction from the outfall structure, or*
- 2). *A distance of 5 times the local water depth in any direction from the outfall structure.*

The discharge length scale is defined as the square root of the discharge cross-sectional area. For the proposed diffuser discharge, the discharge cross-sectional area is 0.2 ft². The local water depth is 29.5 ft (9m). The resulting guideline acute mixing zone as calculated is either:

1). $50 * (\sqrt{0.2}) = 22 \text{ ft (6.8 meters)}$

or

2). $5 * 29.5 = 148 \text{ ft (45 meters)}$

Therefore, the guideline acute mixing zone is 22 ft (6.8 meters).

Based on expected production levels at the Edge Moor facility, the docket holder indicates that the calculated dilutions for the guideline acute mixing zone are insufficient for DuPont to reliably meet the resultant permit limit for acute toxicity ($TU_a = 6.7$). As a result of the evaluation, DuPont requested an alternative acute mixing zone under DRBC's WQR Section 4.20.5.A.1.f. The requested alternative acute mixing zone is for acute toxicity for Outfall 001 (after extension and the addition of the new diffuser).

WQR Section 4.20.5.A.1.f. reads:

*Upon the request of one or more dischargers, the Executive Director may consider request for alternatives to the requirements of subsections a. through e. of Section 4.20.5.A.1. **Such requests shall provide a demonstration that the alternative requirement requested will not adversely impact free-swimming, drifting and benthic organisms.** The demonstration(s) shall provide a sound rationale, and be supported by substantial scientific data and analysis. The methodology and form of the demonstration shall be approved by the Executive Director. The Executive Director may reject any requests which are not substantive. The Commission may establish alternative areas where acute stream quality objectives may be exceeded based upon the evaluation of submitted demonstrations.*

The docket holder submitted a final report titled "DuPont Edge Moor Alternative Mixing Zone Assessment – October 31, 2007" on November 5, 2007. A draft 5.54 TU_a limitation for the discharge from Outfall 001 (existing location) was developed based upon DRBC Water Quality Regulations, Section 4.20.5.A.1a., which provides mixing zone dimension guidelines. DuPont assessed the draft effluent limitation against outfall data from 1997 – June 1998, which was a time when calcium chloride concentrations were elevated due to sustained high production levels. This evaluation determined that DuPont would potentially exceed the 5.54 TU_a effluent limitation 37% of the time during this time frame.

DuPont requested an alternative acute mixing zone of 31 ft (9.43 m) to ensure that permit limits can be reliably achieved at the manufacturing facility during near capacity production levels.

IWTP Flow (MGD)	Acute Mixing Zone Dilution with Diffuser	
	Guideline (22 ft / 6.8 m)	Alternative (31 ft / 9.43 m)
2	26.8	28.2
3.14	32.1	39.25
5	76.0	76.1
5.2	72.9	73.1

DuPont has modeled numerous effluent diffuser scenarios in terms of port size, distance between ports, length of diffuser, angle of discharge, etc. The results of this analysis were presented in a draft HydroQual letter dated June 15, 2006 to Thomas Andersen of DuPont. The location of the diffuser is limited by US Army Corps of Engineers requirements that prohibit construction within 50-100 feet of dredged navigation channels. In this case, the Bellevue Range and Cherry Island Range channels limit the off-shore length of the diffuser. This requirement is to minimize accidental interference with the structures by shipping operations and during maintenance dredging of the channels.

As part of DuPont's request for an alternative acute mixing zone, DuPont indicated that they will continue to meet requirements "b" through "e" of Section 4.20.5.A.1.

- b. Stream quality objectives shall not be exceeded in areas designated as critical habitat for fish and benthic organisms.*

The location of the guideline and proposed alternative diffusers does not represent an area of critical habitat for fish and benthic organisms. The Commission has yet to identify critical habitat areas in Zones 2 through 6.

- c. Stream quality objectives shall not be exceeded where effluent flows over exposed benthic habitat prior to mixing with the receiving waters.*

The existing shore-line discharge location for Outfall 001 does not satisfy this requirement. The proposed alternative acute mixing zone for the new Outfall 001 location will not have the effluent flow over exposed benthic habitat prior to mixing with the Delaware River.

- d. A zone of passage for free-swimming and drifting organisms equal to 50% of the surface width of the river at the location of the discharge shall be provided.*

The alternative acute mixing zone is ~ 1.8% of the surface width of the river.
The guideline acute mixing zone is ~ 1.5% of the surface width of the river.

- e. The total surface area of the Delaware Estuary where stream quality objectives for the protection of aquatic life from acute effects are exceeded shall be limited to 5% of the total surface area of Zone 5.*

The total surface area of the guideline and alternative acute mixing zone is less than 0.001% of the total surface area in Zone 5.

The alternative acute mixing zone must demonstrate that there will be no adverse impact to free-swimming, drifting and benthic organisms.

DuPont indicates that the alternative acute mixing zone will not adversely impact free-swimming organisms because of the relative small size (1.8%) of the mixing zone as compared to the overall width of the river. Additionally, many of the commercially, recreationally and/or ecologically important fish species migrate throughout the estuary depending on their life stage and individual habitat requirements for feeding and reproduction. Many of those fish species encounter natural salinity levels similar to that found in the alternative acute mixing zone approximately 5 miles downstream of the discharge location.

DuPont indicates that the alternative acute mixing zone will not adversely impact drifting organisms because only a small portion of the drifting organisms will be exposed to the effluent. In addition, the alternative acute mixing zone will only increase the estimated duration of exposure of the drifting organisms from 48 to 78 seconds. As drifting organisms travel downstream, they too will experience natural salinity levels similar to that found in the alternative acute mixing zone approximately 5 miles downstream of the diffuser.

DuPont indicates that the alternative acute mixing zone will not adversely impact benthic organisms because the diffuser port is designed so that it points up into the water column. The effluent will exit the ports into the water column so that effluent does not flow over any exposed benthic habitat.

Thermal Mixing Zone

Zone 5 stream quality objectives for temperatures require that the ambient river temperature shall not be raised by more than 4°F (2.2°C) during September through May, nor 1.5°F (0.8°C) during June through August, nor shall the maximum temperature exceed 86°F (30.0°C). The Commission's Interpretive Guideline No. 1 also requires an effluent limitation of 110°F (43.3°C) where the discharge is readily accessible to human contact for the protection of Public Safety. Docket No. D-71-86 previously assigned heat dissipation areas consisting of 400 foot radii around Outfalls Nos.001, 002, and 003 (approved July 27, 1973).

By letter dated August 16, 1993, in order to evaluate the impact of directing up to 3 mgd of non-contact cooling water from Outfall No. 002 to Outfall No. 003, the Commission required

DuPont to perform a thermal study of the cooling water discharges from the Edge Moor facility. The docket holder submitted a report titled "Thermal Study of Cooling Water Discharges from DuPont Edge Moor into the Delaware Estuary" in March 1995. Subsequently, DuPont requested a modified heat dissipation area for a 6 mgd discharge from Outfall No. 003 at an effluent temperature of 110°F. By letter dated September 8, 1995, the Commission responded to the DuPont request to modify the heat dissipation area for Outfall No. 003. The Commission granted a heat dissipation area around Outfall No. 003 of 328 ft (100 m) lateral to the shore and 2,953 feet (900 m) longitudinal to the shore, both upstream and downstream of the outfall. The original heat dissipation areas of 400 feet radii around Outfalls Nos. 001 and 002 were unchanged and still considered valid (for the existing Outfall No. 001 location and Outfall No. 002). A new heat dissipation area for the proposed relocation of Outfall No. 001 is required.

The docket holder requested a modification to their NPDES permit temperature effluent limit from Outfall No. 003 on November 6, 1996 in order to accommodate a process change. The docket holder requested a 6 mgd discharge at 119°F. The docket holder submitted modified CORMIX modeling information to support their request. The existing heat dissipation area for Outfall No. 3 would not have to be changed as result of this request. The Commission requested DuPont to submit additional materials addressing Interpretive Guideline No. 1 which requires an effluent limitation of 110°F (43.3°C) where the discharge is readily accessible to human contact for the protection of Public Safety. DuPont stated that the area around Outfall No. 003 was not likely to see human contact. DuPont withdrew their request to both DRBC and DNREC for the temperature limit increase on May 5, 1997. DuPont installed cooling towers to reduce the increased water temperature due to a process change to comply with the existing temperature limit of 110°F (43.3°C).

The proposed change in discharge location for Outfall 001 (after extension and addition of the diffuser) requires a new thermal mixing zone analysis. DuPont submitted a final report titled "DuPont Edge Moor Thermal Mixing Zone Analysis for Outfall 001 Effluent Diffuser – November 5, 2007" on November 5, 2007. The analysis was completed for a discharge temperature of 112F at effluent flows of 2, 3.14, 5 and 5.2 mgd, and utilized the CORMIX Model.

In addition to DRBC thermal requirements, the discharge is also subject to the Delaware Department of Natural Resources and Environmental Control's (DNREC) Thermal Regulations (Section 4.5.1.1 and Section 6.4.2). The discharge is controlled by the more stringent of the two criteria. In summary, the DRBC's temperature rise criteria and DNREC's maximum true daily mean and daily maximum temperature criteria control the discharge requirements. The Delaware River's width at the point of discharge is ~ 6,070 ft (1,850 m), which corresponds to a DNREC determined maximum mixing zone width of 3,035 ft (925 m) and a DRBC determined maximum mixing zone length of 3,500 ft (1,067 m). The DNREC maximum thermal mixing zone cross-sectional area is 49,788 ft² (4,625 m²) for the Delaware River, where the width is 6,070 ft (1,850 m) and average depth is 29.5 ft (9 m).

DuPont modeled the proposed 3-Port diffuser's discharge with ambient river temperature scenarios and at critical conditions (low water, slack tide). The ambient river temperature data consisted of USGS daily temperature records taken at the Delaware Memorial Bridge (approximately 4.5 miles downstream from Outfall 001) from 1965 to 1981. DuPont's modeling efforts indicate that a thermal mixing zone 49.2 ft (15 m) upstream, 49.2 ft (15 m) downstream, and 148 ft (45 m) latterly from the diffuser is required to satisfy DRBC & DNREC thermal requirements. In total, the thermal mixing zone would be ~ 98 ft (30 m) in the longitudinal direction and 148 ft (45 m) in the lateral direction centered on the diffuser (including the 49.2 ft/15 m size of the diffuser itself). The proposed thermal mixing zone is much less than the allowable mixing zone size limitations.

Proposed Outfall No. 1	Proposed Thermal Mixing Zone	Allowable Thermal Mixing Zone
Length:	98 ft / 30 m	3,500 ft / 1,067 m
Width:	148 ft / 45 m	3,035 ft / 925 m
Cross Sectional Area (Width X Depth) (depth = 29.5 ft / 9 m)	4,366 ft ² / 405 m ²	49,788 ft ² / 4,626 m ²

DuPont requested a thermal mixing zone with a length of 98 ft (30 m) and a width of 148 ft (45 m) for Outfall 001 to ensure that permit limits can be reliably achieved at the manufacturing facility during near capacity production levels.

Total Dissolved Solids (TDS)

DuPont submitted a TDS determination request to supplement their application package on November 5, 2007. Zone 5 stream quality objectives do not explicitly include TDS. As a consequence, the Commission finds that Basinwide TDS requirements are not always applied in Zone 5. The Commission reserves the right, in accordance with the WQR and the *Rules of Practice and Procedure*, to apply the Basinwide TDS requirements in Zone 5 when and where it determines that the requirements are necessary to protect water uses in Zone 5.

The Commission's basin-wide TDS criteria is that 1) the receiving stream's resultant TDS concentration be less than 133% of the background, and 2) the receiving stream's resultant TDS concentration be less than 500 mg/l. The TDS requirements were applied to the Edge Moor facility's discharge because of its location several miles above the usual salinity line (250 mg/l chlorides) of the Estuary. There are no public water supply intakes downstream of the docket holder's discharge.

The docket holder's TDS consists primarily of Calcium, Sodium, Chloride and Sulfate. TDS is formed during the neutralization of ferric chloride and hydrochloric acid with lime and sodium hydroxide. The docket holder is currently exploring the potential to sell Hydrochloric acid (HCl) that

is currently neutralized in the IWTP. The docket holder estimates that if it can remove HCl from the IWTP, TDS concentrations may decrease by 10-15%. The docket holder has developed a correlation for its wastewater's chloride concentration and specific conductivity. The docket holder will be required to develop a relationship between its TDS concentrations and specific conductivity, since there are other constituents of TDS other than just chlorides. The docket holder's proposed effluent extension and diffuser will require a mixing zone for TDS. The background concentration of TDS at the docket holder's discharge location varies seasonally throughout the year.

DuPont shall monitor for both TDS and specific conductivity at Outfall 001 twice/month, as required in Effluent Table A.2. The monitoring shall be performed in order to develop a TDS and specific conductivity relationship. DuPont shall submit a report within 30 months of docket approval which includes (at least) the 48 TDS samples and the corresponding specific conductivity values, along with an analysis that summarizes their statistical relationship. During the next docket renewal, the Commission will use these data to determine an appropriate monthly average and daily maximum TDS effluent limit and corresponding TDS mixing zone for Outfall 001.

CBOD₂₀ Wasteload Allocation

The Commission's Water Quality Regulations provide for the allocation of the stream assimilative capacity where waste discharges would otherwise result in exceeding such capacity. It was determined in the 1960's that discharges to the Delaware Estuary be limited to a total of 322,000 lbs/day of carbonaceous biochemical (first stage) oxygen demand (CBOD₂₀). In accordance with the Regulations, the assimilative capacity of each Delaware Estuary zone minus a reserve was originally allocated in 1968 among the individual dischargers based upon the concept of uniform reduction of raw waste in a zone (Zones 2, 3, 4 and 5). The totals and percent reduction for each zone are given in Table 1 of the Commission's *Status of CBOD₂₀ Wasteload Allocations* (Revised October 1, 2000). The DuPont Edge Moor facility is located in Zone 5 at river mile 73.4. Zone 5 has a reserve capacity of ~23%. The DuPont Edge Moor facility has had the following allocations of CBOD₂₀:

November 2, 1970	4,230 lbs/day CBOD ₂₀	(Reference # 18)
July 23, 1973	410 lbs/day BOD ₅	(Reference #62)
July 9, 1975	600 lbs/day CBOD ₂₀ = 410 lbs/day of BOD ₅	(Reference #64)
July 22, 1981	1,430 lbs/day CBOD ₂₀ = 1300 lbs/day of BOD ₅	(Reference #117)

The current allocation of 1,430 lbs/day of CBOD₂₀ (1300 lbs/day of BOD₅) is active for the DuPont Edge Moor facility. The current allocation is based upon a calculated allocation using the permitted flow from Outfall 001 (5.2 mgd) multiplied by the permit limit for BOD₅.

Section 3.10.6.D.2. of the Commission's Water Quality Regulations allow the basin-wide percent reduction requirement (85%) for biochemical oxygen demand (BOD) for dilute industrial wastewaters to be modified upon application. The docket holder has requested the removal of this requirement for BOD removal since their facility is an inorganic manufacturing facility and the resulting wastewater contains very low levels of BOD. Additionally, the IWTP is not designed to remove BOD. The docket holder has submitted data to show that the average BOD₅ effluent concentration from Outfall 001 was 2.77 mg/l from 2003 – 2007. The Commission has determined that the percent reduction for BOD is not applicable to this type of industrial wastewater.

PCB TMDL

The docket holder has been identified as a Group 1 discharger for the PCB TMDL of the Delaware Estuary. The docket holder shall continue to monitor for PCBs as required in their NPDES permit. The docket holder shall continue to implement the Pollutant Minimization Plan (PMP) developed specifically for the Edge Moor Titanium Dioxide facility.

In 2001, after DuPont discovered that one of the reactions in the Edge Moor manufacturing process inadvertently generated PCBs, DuPont made a corporate commitment to reduce the incidental generation of PCBs, dioxin and dioxin-like compounds at Edge Moor by 90% by the end of 2007. To accomplish the reductions:

- DuPont replaced a dust suppressant for coke which was determined to be a precursor for dioxin formation in the critical reaction zone, with an alternative dust suppressant.
- Switched to the purge separation process as the most effective process modification method (removes organics from the titanium chloride recycle stream to critical reaction zone).
- Purge separation process modifications expected to be in operation in 2007.

Other

At the project discharge site, the Delaware River is tidal and its flow is regulated by upstream reservoir releases. The Trenton low flow target is 2,500 cfs (1.62 billion gallons per day). The addition of the tidal tributaries upstream of the discharge location at their Q7-10 flow and the low flow Trenton target results in a low-flow of approximately 4,318 cfs (2.79 billion gallons per day) for the Delaware River at the discharge location (River Mile 73.2).

- The ratio of this low flow to the average design wastewater discharge from Outfall No. 1 (5.2 mgd) is 536 to 1. (0.2 % of low flow)
- The ratio of this low flow to the average non-contact cooling water discharge from Outfall No. 2 (2.89 mgd) is 966 to 1. (0.1% of low flow)
- The ratio of this low flow to the average non-contact cooling water discharge from Outfall No. 3 (5.9 mgd) is 473 to 1. (0.21 % of low flow)

The limits in the NPDES Permit are in compliance with Commission effluent quality requirements, where applicable.

The project is designed to produce a discharge meeting the effluent requirements as set forth in the *Water Quality Regulations* of the DRBC.

The project does not conflict with the Comprehensive Plan and is designed to prevent substantial adverse impact on the water resources related environment, while sustaining the current and future water uses and development of the water resources of the Basin.

C. DECISION

I. Effective on the approval date for Docket No. D-71-86-2 below, Docket No. D-71-86 is terminated and replaced by Docket No. D-71-86-2.

II. The project and appurtenant facilities as described in the Section A “Physical features” of this docket are approved pursuant to Section 3.8 of the *Compact*, subject to the following conditions:

a. Docket approval is subject to all conditions, requirements, and limitations imposed by the DNREC in its NPDES permit, and such conditions, requirements, and limitations are incorporated herein, unless they are less stringent than the Commission’s.

b. The facility and operational records shall be available at all times for inspection by the DRBC.

c. The facility shall be operated at all times to comply with the requirements of the *Water Quality Regulations* of the DRBC.

d. The docket holder shall maintain and make available to DRBC upon request, records identifying the sources, volumes and characteristics of all wastewaters and sludges treated at the IWTP. Records are to be retained for 5 years.

e. The docket holder shall comply with the requirements contained in the Effluent Table in Section A.4.d. of this docket. The docket holder shall submit DRBC required monitoring results directly to DRBC (Modeling, Monitoring and Assessment Branch). The monitoring results shall be submitted annually absent any observed limit violations. If a DRBC effluent limit is violated, the docket holder shall submit the results and provide a written explanation within 30 days of the violation the action(s) the docket holder has taken to correct the violation and protect against a future violation.

f. The docket holder shall monitor for Acute Toxicity 1 time/month when conductivity values are less than or equal to 40,000 ($\mu\text{S}\cdot\text{cm}^{-1}$) at Outfall No. 001. When conductivity values at Outfall No. 001 exceed 40,000 ($\mu\text{S}\cdot\text{cm}^{-1}$), the docket holder shall perform Acute Toxicity monitoring 2 times/month until the conductivity values drop below 40,000 ($\mu\text{S}\cdot\text{cm}^{-1}$). After 18 months of monthly sampling, the docket holder can request in writing to the Executive Director to modify the acute toxicity monitoring frequency requirement from monthly to quarterly. The docket holder may conduct the monthly acute toxicity monitoring on cladoceran, (*Daphnia magna*). If the docket holder is granted the quarterly acute toxicity monitoring, both cladoceran (*Daphnia magna*) and the fathead minnow (*Pimephales promelas*) should be tested. The docket holder shall submit individual TUa sampling results to both DRBC and DNREC within 30 days of receipt from the laboratory. The docket holder shall submit a summary of the Acute Toxicity monitoring results along with corresponding flow, specific conductivity, and TDS concentrations (if available) to both DNREC and DRBC (Modeling, Monitoring and Assessment Branch) on an annual basis (calendar year). The first annual report should be submitted in January 2009.

g. The docket holder may submit an alternative monitoring plan to the Executive Director that analyzes the acute toxicity of effluent from Outfall 001 at high production and conductivity values. The docket holder shall continue to monitor for acute toxicity as outlined in Condition II. g. until the Executive Director approves an alternative monitoring plan.

h. Except as otherwise authorized by this docket, if the docket holder seeks relief from any limitation based upon a DRBC water quality standard or minimum treatment requirement, the docket holder shall apply for approval from the Executive Director or for a docket revision in accordance with Section 3.8 of the *Compact* and the *Rules of Practice and Procedure*.

i. If at any time the receiving treatment plant proves unable to produce an effluent that is consistent with the requirements of this docket approval, no further connections shall be permitted until the deficiency is remedied.

j. Nothing herein shall be construed to exempt the docket holder from obtaining all necessary permits and/or approvals from other State, Federal or local government agencies having jurisdiction over this project.

k. The discharge of wastewater shall not increase the Zone 5 ambient river temperature by more than 4°F (2.2°C) during September through May, nor 1.5°F (0.8°C) during June through August, nor shall the maximum temperature exceed 86°F (30.0°C) except within the following assigned heat dissipation areas:

Outfall No. 001: 400 ft radius around outfall (existing outfall location)

Outfall No. 001: 148 ft (45 m) wide X 98 ft (30 m) long X 29.5 ft deep
(centered on diffuser – effective after completion of the outfall extension and diffuser)

Outfall No. 002: 400 ft radius around outfall

Outfall 003: 328 ft (100 m) wide X 2,953 ft (900 m) long
{both upstream and downstream of the outfall for a total length of 5,906 ft (1800 m)}

l. The discharge of wastewater shall not increase the Zone 5 acute toxicity stream quality objective of 0.3 Toxic Units (TUa = 0.3) except within the following assigned acute alternative mixing zone:

Outfall No. 001: 31 ft long X 111 ft wide X 29.5 ft deep - centered on diffuser

m. The approval of the Outfall No. 001 extension and diffuser project shall expire upon the expiration date of this docket, unless prior thereto the docket holder has commenced the construction or operation of the outfall extension and diffuser project, or the docket is administratively continued or included in a renewal docket issued by the Commission. If the construction of the extension and diffuser project has commenced prior to the expiration of this docket, any docket renewal will include the approval of such project.

n. DuPont shall monitor for both TDS and specific conductivity at Outfall 001 twice/month, as required in Effluent Table A.2.. The monitoring shall be performed in order to develop a TDS and specific conductivity relationship. DuPont shall submit a report within 30 months of docket approval which includes (at least) the 48 TDS samples and the corresponding specific conductivity values, along with an analysis that summarizes their statistical relationship. During the next docket renewal, the Commission will use this data to determine an appropriate monthly average and daily maximum TDS effluent limit and corresponding mixing zone for Outfall 001.

o. DuPont shall notify the Commission in writing at least 10 business days before the Aqua Fox process is initiated and non-contact cooling water is planned to be discharged from Outfall 002

p. Sound practices of excavation, backfill and reseeding shall be followed to minimize erosion and deposition of sediment in streams.

q. Outfall 001 shall be extended and a diffuser shall be added in accordance with the plans submitted as part of the docket application. The extended outfall and diffuser shall be placed in operation by January 1, 2010. Upon completion of the Outfall 001 extension and diffuser project, the effluent limit in Table A-1 for Acute Toxicity shall apply.

r. Within 10 days of the date that construction of the Outfall No. 1 extension and diffuser project has started, the docket holder shall notify the DRBC of the starting date and scheduled completion date.

s. DuPont shall notify the Commission if the design plans for the Outfall 001 extension and diffuser have been significantly modified from the plans submitted. Significant modifications will require Executive Director approval.

t. Upon completion of construction of the approved project, the docket holder shall submit a statement to the DRBC, signed by the docket holder's engineer or other responsible agent, advising the Commission that the construction has been completed in compliance with the approved plans, giving the final construction cost of the approved project and the date the project is placed into operation.

u. The approval of the Outfall No. 1 extension and diffuser project shall expire upon the expiration date of this docket, unless prior thereto the docket holder has commenced the construction or operation of the outfall extension and diffuser project, or the docket is administratively continued or included in a renewal docket issued by the Commission. If the construction of the extension and diffuser project has commenced prior to the expiration of this docket, any docket renewal will include the approval of such project.

v. The docket holder is permitted to treat and discharge the categories of wastewaters defined in the "Area Served" section of this docket.

w. The docket holder shall make wastewater discharge in such a manner as to avoid injury or damage to fish or wildlife and shall avoid any injury to public or private property.

x. No sewer service connections shall be made to newly constructed premises with plumbing fixtures and fittings that do not comply with water conservation performance standards contained in Resolution No. 88-2 (Revision 2).

y. Nothing in this docket approval shall be construed as limiting the authority of DRBC to adopt and apply charges or other fees to this discharge or project.

z. The issuance of this docket approval shall not create any private or proprietary rights in the waters of the Basin, and the Commission reserves the right to amend, suspend or rescind the docket for cause, in order to ensure proper control, use and management of the water resources of the Basin.

aa. A complete application for the renewal of this docket, or a notice of intent to cease the operations (withdrawal, discharge, etc.) approved by this docket by the expiration date, must be submitted to the DRBC at least 6 months prior to the expiration date below (unless permission has been granted by the DRBC for submission at a later date), using the appropriate DRBC application form. In the event that a timely and complete application for renewal has

been submitted and the DRBC is unable, through no fault of the docket holder, to reissue the docket before the expiration date below, the terms and conditions of this docket will remain fully effective and enforceable against the docket holder pending the grant or denial of the application for docket approval.

bb. The Executive Director may modify or suspend this approval or any condition thereof, or require mitigating measures pending additional review, if in the Executive Director's judgment such modification or suspension is required to protect the water resources of the Basin.

cc. The docket holder and any other person aggrieved by a reviewable action or decision taken by the Executive Director or Commission pursuant to this docket may seek an administrative hearing pursuant to Articles 5 and 6 of the Commission's *Rules of Practice and Procedure*, and after exhausting all administrative remedies may seek judicial review pursuant to Article 6, section 2.6.10 of the *Rules of Practice and Procedure* and section 15.1(p) of the Commission's *Compact*.

dd. The docket holder may request of the Executive Director in writing the substitution of specific conductance for TDS. The request should include information that supports the effluent specific correlation between TDS and specific conductance. Upon review, the Executive Director may modify the docket to allow the substitution of specific conductance for TDS monitoring.

BY THE COMMISSION

DATE APPROVED: December 12, 2007

EXPIRATION DATE: December 31, 2011